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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,230	11/14/2003	Sam-Shajing Sun	036021.0001	2469

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EXAMINER
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HALL, ASHA J

ART UNIT	PAPER NUMBER
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1709

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/26/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/714,230	SUN, SAM-SHAJING	
	Examiner	Art Unit	
	Asha Hall	1709	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 November 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 1-8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-21 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/14/2003 and 12/15/2003</u> .                               | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

Group I, Claim 1-8, drawn to a photovoltaic device based on block copolymer, classified in class 136, subclass 263.

Group II, Claim 9-21, drawn to a method of forming a photovoltaic block copolymer, classified in class 257, subclass 258.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make a materially different product. For example, the process claimed can be employed with other polymer materials (i.e. PMMA or poly(3-hexylthiophene)).

3. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because

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the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Priority***

5. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35U.S.C. 119 (e) as follows: The applicant claims benefit to 60/428,108 on the bibliographic data sheet. The data provided by the applicant is not consistent with the Patent and Trademark Office records.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

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7. Claims 12 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "easily" in claim 12 is a relative term, which renders the claim indefinite. The term "easily" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The term "enhancing" in claim 19 is a relative term, which renders the claim indefinite. The term "enhancing" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

In claim 19, the phrase "photovoltaic block copolymer film" renders the claim unclear according to the context of the claim. As stated in the application, the photovoltaic block copolymer film contains donor and acceptor carrier materials, which are portrayed as being apart of the photovoltaic block copolymer film (paragraph 3 & Figure 12). The term of the photovoltaic block copolymer film has been interpreted as the device.

### ***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

9. Claims 9-16 are rejected under 35 U.S.C. 102(a) as being anticipated by Fan et al., ("Synthesis and Characterization of a Novel Block Copolymer," Proceedings of Polymeric Materials: Science & Engineering, v.86, 47, 2002).

With regard to claim 9, Fan et al. discloses the method for forming an organic photovoltaic device, comprising of synthesizing photovoltaic block copolymer samples:

- (a) dissolving the photovoltaic block copolymer samples in a solvent (paragraph 2);
- (b) filtering the copolymer-solvent mixture (paragraph 2);
- (c) forming a film of the copolymer-solvent mixture on a pretreated glass slide/prepared surface (paragraph 2);
- (d) removing the solvent/dried overnight (paragraph 2).

With respect to claim 10, Fan et al. further shows:

- (a) individually synthesizing conjugated donor chains (Figure 1), conjugated acceptor chains (Figure 1),
- (b) non-conjugated bridge chains (Figure 1);
- (c) combining the non-conjugated bridge chains with the conjugated donor chains to form a plurality of bridge-donor-bridge units; and
- (d) combining the bridge-donor-bridge units with the conjugated acceptor chains (paragraph 5).

In regard to claim 11, Fan et al. further discloses the photovoltaic block copolymer samples synthesized by:

- (a) individually synthesizing conjugated donor chains (Figure 1),
- (b) conjugated acceptor chains and non-conjugated bridge chains (Figure 1); combining the non-conjugated bridge chains with the conjugated acceptor chains to form a plurality of bridge-acceptor-bridge units (paragraph 5);
- (c) combining the bridge-acceptor-bridge units with the conjugated donor chains (Figure 1).

With respect to claim 12, Fan et al. further discloses the solvent dried overnight in the heated vacuum oven (paragraph 2).

In regard to claim 13, Fan et al. further discloses that the copolymer-solvent solution is filtered using a filter having a pore size of about 0.2 microns (paragraph 2).

With respect to claim 14, Fan et al. further discloses that the film is formed by a method selected from the group consisting of spin coating and drop drying (paragraph 2).

In regard to claim 15, Fan et al. further discloses that the prepared surface is pre-cleaned, conducting glass/pretreated glass slides (paragraph 2).

With respect to claim 16, Fan et al. further discloses that the solvent is removed by a method selected from the group consisting of heating, vacuum exposure and a combination of heating and vacuum exposure (paragraph 2).

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. ("Synthesis and Characterization of a Novel Block Copolymer," Proceedings of Polymeric Materials: Science & Engineering, v.86, 47, 2002) as applied to claim 9 above, in view of Allen et al. (5,041,510) and Visscher et al., ("Construction of Multiple-Beam Optical Traps with Nanometer-Resolution Position Sensing", IEEE Journal of Selected Topics in Quantum Electronics, vol. 2, Issue 4, pages 1066-1076 (Dec.1996)).

With respect to claim 17, Fan et al. discloses the methods with respect to claim 9 above, but fails to disclose applying to the device a force selected from the group consisting of magnetic, electrical, and optical forces. Allen et al. discloses the processing of copolymer block film (col.6; lines15-24); and discloses applying a force to polymer selected from the group consisting of magnetic and electrical (col.3; lines 66-68 & col.4; lines 1-2) forces to induce alignment of mobile dipolar copolymers (col. 3; lines 66-68). Thus, it would have been obvious to one skilled in the art at the time of the invention to apply magnetic and electrical forces as taught by Allen to modify Fan et al. in order to mobilize the dipolar (charge carriers within) copolymers.



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Fan et al. in view of Allen et al. fails to disclose applying an optical force to the block copolymer. However, Visscher et al. discloses the ability to manipulate molecules with forces on a molecular scale (p. 1075) and applying the use of an optical force, (also known as "optical tweezers") to generate charge carrier displacement (to move positive and negative charges) along the polymeric tracks (p. 1066). Thus, it would have been further obvious to one skilled in the art at the time of the invention to apply an optical force as taught by Visscher et al. in modified Fan et al. in order to move the charges more effectively along the conjugated chains and towards the electric field directions.

12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brabec et al., ("Origin of the Open Circuit Voltage of Plastic Solar Cells", Advanced Functional Materials, vol. 11, Issue 5, pages 374-380 (2001)) in view of Sethuraman et al. (5,972,124).

In regard to claim 18, Brabec et al. discloses:

- (a) the cleaning of entire piece of conducting glass (experimental paragraph 1; p. 379);
- (b) synthesizing a photovoltaic block copolymer from conjugated donor chains, conjugated acceptor chains and non-conjugated bridge chains (experimental paragraph 1; p. 379);
- (c) spin coating the piece of conducting glass (experimental paragraph 1; p. 379) with the photovoltaic block copolymer to form a film having a thickness of about 100nm (paragraph 2.3.1; p. 376);

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(d) vacuum depositing an electrode material on top of the film wherein the electrode material has a thickness of about 100nm (paragraph 2.3.2; p. 377), such that a positive electrode and a negative electrode are formed (paragraph 2.3.2; p. 377).

Brabec et al. fails to disclose a method of immersing a portion of conducting glass specifically in sulfuric acid. Whereas, Sethuraman et al. teaches a method of cleaning conducting glass (col. 4; lines: 25) and immersing a portion of a piece of conducting glass in a concentrated sulfuric acid cleaning solution (col.4; lines; 11-12 and lines: 25-29) to successfully clean the conducting glass without removing metals (col.4; lines: 34-35). Thus, it would have been obvious to one skilled in the art at the time of the invention to apply the cleaning steps as taught by Sethuraman et al. to the method of Brabec et al. in order to successfully clean the conducting glass without removing metals.

13. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brabec et al., ("Origin of the Open Circuit Voltage of Plastic Solar Cells", Advanced Functional Materials, vol. 11, Issue 5, pages 374-380 (2001)) in view of Sethuraman et al. (5,972,124) as in claim 18 above, and in further view of Nava et al., ("Fullerene-functionalized polyesters: synthesis, characterization and incorporation in photovoltaic cells", New Journal of Chemistry, vol. 26, pages 1584-1589 (2002)).

With respect to claims 19 and 20, modified process of Brabec et al. discloses the elements of claim 18 as discussed above, but fails to disclose forming one or more films of carrier materials. Nava et al. discloses processing of copolymer films (paragraph 2; p. 1587) and discloses forming one or more carrier films of lithium fluoride (paragraph 2; p. 1587) and poly(ethylene dioxythiophene)/polystyrene sulfuric acid (PEDOT:PSS) (paragraph 1; p. 1587) that shows clear photovoltaic behavior(paragraph 2; p. 1587). Thus, it would have been obvious to one skilled in the art at the time of the invention to include the carrier films of lithium fluoride and poly(ethylene dioxythiophene)/polystyrene sulfuric acid (PEDOT:PSS) as taught by Nava et al. to the method of Brabec et al. in order to form one or more films that shows clear photovoltaic behavior.

14. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brabec et al., ("Origin of the Open Circuit Voltage of Plastic Solar Cells", Advanced Functional Materials, vol. 11, Issue 5, pages 374-380 (2001)) in view of Sethuraman et al. (5,972,124) as in claim 18 above, and in further view of Hummelen et al. ("Stability issues of conjugated polymer/ fullerene solar cells from a chemical viewpoint", Proceedings of SPIE vol. 4108, (2001),p76-83).

With respect to claim 21, modified steps of Brabec et al. discloses:

(a) the forming of a film synthesized from donor chains (holes) between the positive electrode and the photovoltaic block copolymer film (paragraph 2.3.2; p.377).;

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(b) and forming a film synthesized from acceptor chains (electrons) between the negative electrode the photovoltaic block copolymer film (paragraph 2.3.2; p.377).

However, modified Brabec et al. fails to disclose a photovoltaic block film with donor and acceptor chains between the positive and negative electrodes. Hummelen et al. discloses a photovoltaic block film (p.77, Figure 1b.) with synthesized donor and acceptor chains in Figure 1.b (p.77) to have the holes flow towards the positive electrode and electrons flow towards the negative electrode. Thus, it would have been obvious to one skilled in the art at the time of the invention to apply the modified steps of Brabec et al. to synthesize a photovoltaic block copolymer with donor and acceptor chains to supply a charge transfer in the photovoltaic block copolymer.

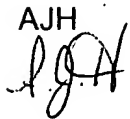
### ***Conclusion***

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asha Hall whose telephone number is 571-272-9812. The examiner can normally be reached on Monday-Friday 7:30-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AJH  


  
ALEXA D. NECKEL  
SUPERVISORY PATENT EXAMINER